Public Key Infrastructure for the National Computational Science Alliance

(*the keys to the VMR*)

Randy Butler
Von Welch

National Computational Science Alliance

Presentation Outline

- **Alliance Secure Authentication Project**
  - **Background & Motivations**
  - **Process**
  - **Alliance PKI Components**
- **Grid Forum security activities**
- **MyProxy Key Management Service**

Alliance Computational Grid

- **Deploy standard infrastructure across Alliance sites.**
  - **Provide maximum capabilities to apps.**
  - **Increase what can be “taken for granted” when developing applications.**
  - **Reduce deployment burden at sites**
  - **Make it easy for new sites to join**

- **Alliance Computational Resources and Services (ACRS) sites**
  - **AHPCC, BU, MHPCC, NCSA, UKCC, UWisc**

Authentication Project Goals

- **Provide basis for grid security service**
- **Alliance identity for secure authentication**
- **Cross domain authentication**
- **Single sign-on**
- **Support grid applications *(API)***
- **Support grid services**
- **Scalable**
- **Interoperable *(don't mess up local site auth & acct mgt)***
- **Simple user interactions**
- **Extensible *(digital signatures encryption)***

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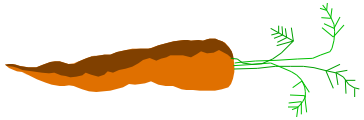

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Phase 1 Information Gathering

- **Surveyed ACRS site's authentication solutions**
  - **SSH – Kerberos – Unix Login**
- **Surveyed ACRS site's policies**
  - **none identified**
- **Proposed workshop to discuss Alliance strategy**
  - **ACRS sites policy and technical reps.**
  - **Technology developers (Globus team)**
  - **Security leads from other grid efforts**

Alliance Secure Authentication Workshop

- **Facilitator (Mark Bruhn)**
  - **Key to Workshop success!**
  - **Instrumental in early phases of the effort**
- **Proposed**
  - ✓ **Building an Alliance Public Key Infrastructure**
  - ✓ **Implementing via the Grid Security Infrastructure**
- **Adopted parallel tracks**
  - **Technical**
  - **Policy**
- **Agreed on the process**
  - **Task leads**
  - **Face-to-face &**
  - **Email discussions**

Technical Track

- Certificate Profile
  - Field population
  - Extensions
- Multiple CA acceptance
- Support for CRLs
- Mapping issues
- Software verification
- Platform support
- Error handling
- Administration tools
- Site specifics
- Enable policy requirements

Policy Track

- Alliance PKI Blueprint
- Modeled after the Federal PKI Working Group (FPKIWG) Model Certificate Policy (CP)
- Slogged through the document paragraph by paragraph, line by line.
- Process identified many technical requirements
- Required understanding of technical limitations

- Required leadership but not dictatorship

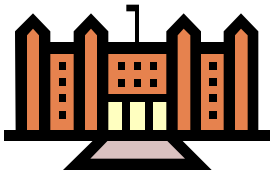
Related Alliance Activities

- Alliance Account Management Working Group
  - Allocations
  - ACRS site account administration groups
  - Allocations database
- Outreach
  - Documentation
  - Training
  - Promotion
  - Support
- Processes
  - Distinguished Names
  - Grid Mapfile Administration
  - Certificate Revocation
  - Identity Vetting
  - Credential Request/Retrieval

Basic Alliance PKI Components

- **Certificate Policy and Procedures**

- **Certificate & Registration Authorities**
  - **Certificate Generation Process**
  - **Distinguished Names**
  - **Registration**



- **PKI Administration and Support**
  - **Documentation**
  - **Grid Mapfiles**
  - **Revocation**
- **Grid Security Infrastructure Service**
  - **Certificate Request and Retrieval**
  - **Authentication Services**

Alliance PKI Certificate Creation Basics

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Requestor Generates Key Pair
cert_request/browser

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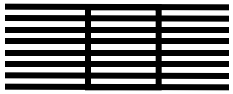

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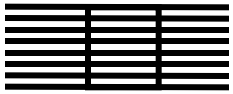

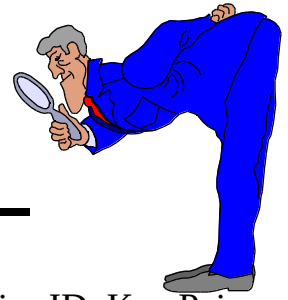

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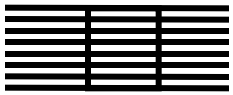

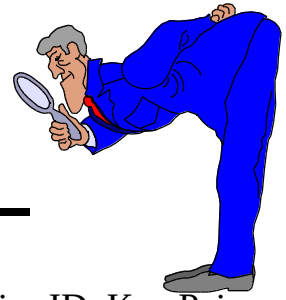

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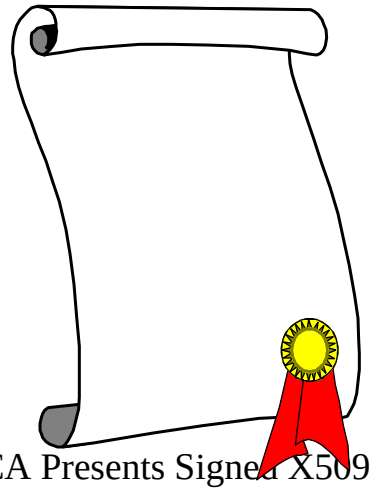

CA Presents Signed X509 v3
Certificate to Requestor

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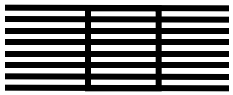

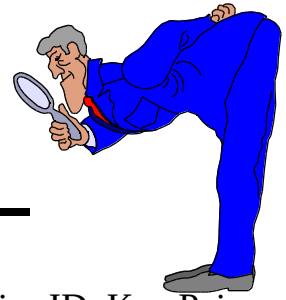

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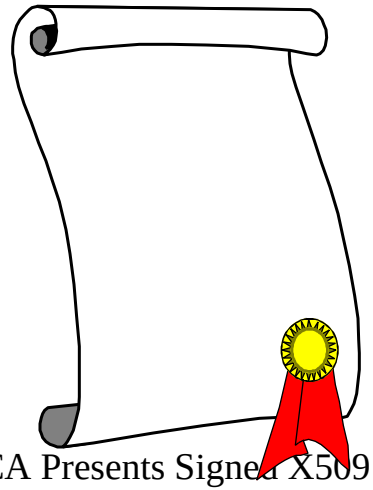

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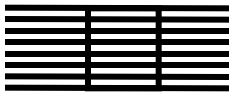

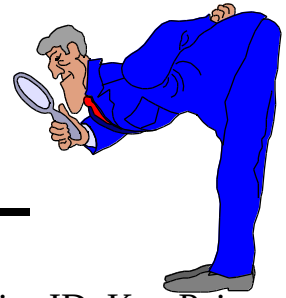

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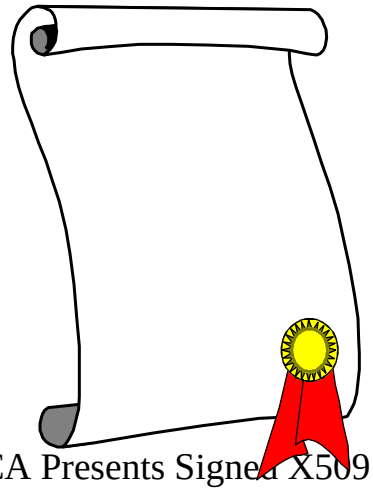

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GSI Administration

- **Account Management System**
  - **Grid Mapfile Administration**
    - **Pushed from NCSA to ACRS sites**
  - **Certificate Revocations**
    - **Update of grid mapfile and CRL push**
  - **Distinguished Name Administration**
    - **Today Alliance DNs only**
- **Documentation**

Deployment and Testing

- **Early Users**
  - PKI deployment & support team
  - Eager applications developers
  - Globus certified users
  - Registration process

- **User Documentation**
  - Major effort documenting
    - Certificate process
    - GSI
    - admin

Production

- Couple thousand certificates
- Registration process
  - Registration models (You get what you pay for!)
    - Classic PKI user verification
    - Streamlined verification
- Replace local account access*
- Cross certification issues
- Key Management
- Long Term CA thoughts

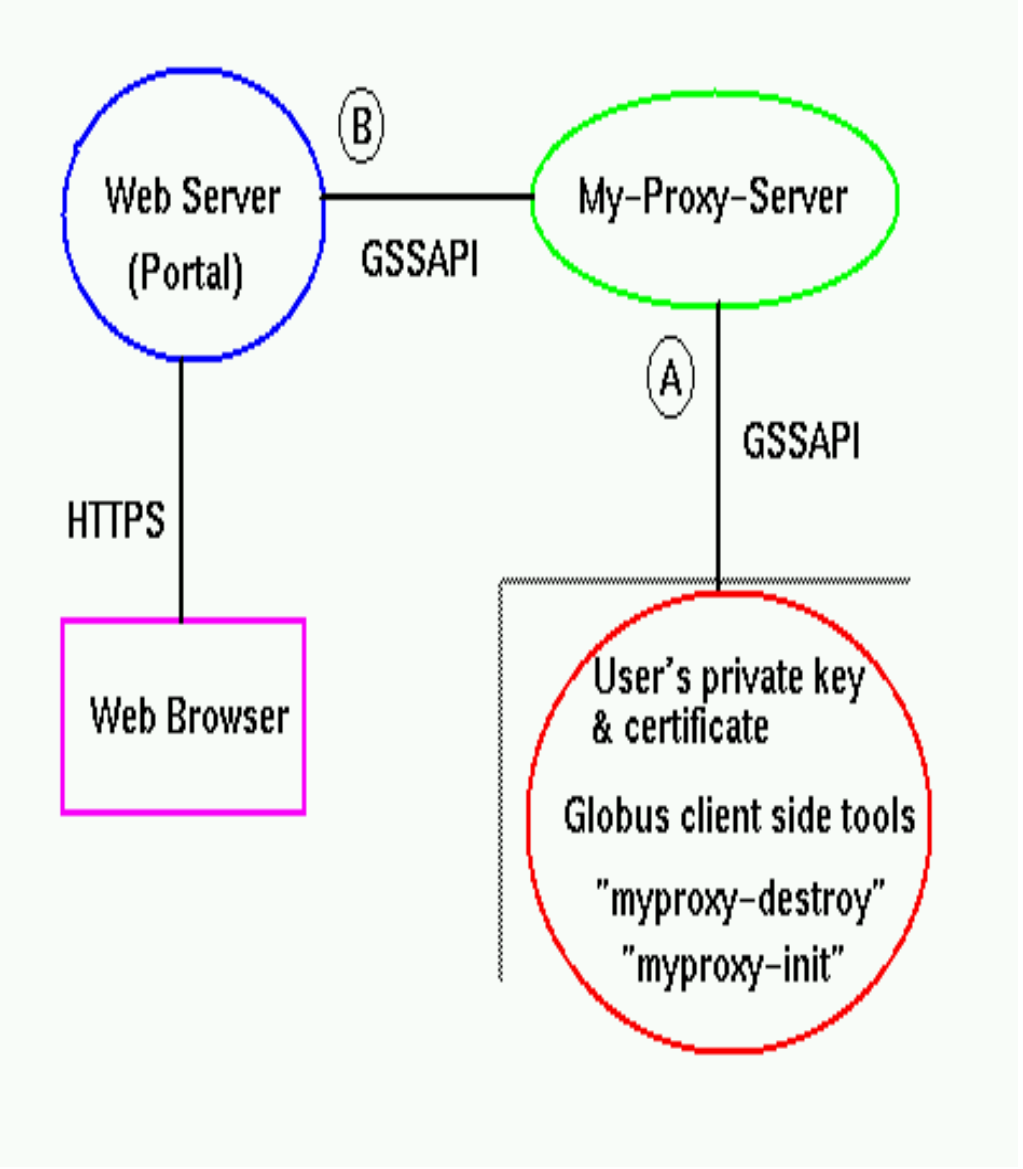
GridForum related activities

- GSI effort lead by Steve Tuecke & Marty Humphrey
  - Identify Grid Security Requirements
  - Map to or extend GSI
- Certificate Policy effort lead by Randy Butler and John Volmer
  - Identify Grid Policy Requirements
  - Lead to a Grid Certificate Policy Model
    - So “we” can more readily exchange certificates without closing our eyes
    - To act as a blueprint for new Grid PKIs

Alliance Key Management Research

MyProxy Security Delegation Service
Driven by Alliance Science Portals

- **One thing that differentiates a portal from a web page is its ability to do work on behalf of the user.**
- **This however requires some sort of delegation.**
- **MyProxy was developed to "securely" serve this need.**



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PKI Key Management Issues

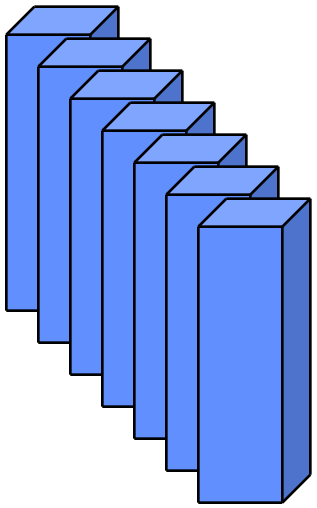
- **Challenging for users**
  - **Install private key and cert on every “from’ host**
  - **Vulnerable when left on a “foreign” host**
  - **Which certificate when, etc…….**
- **Concerning for security administrators**
  - **Users will look for short cuts**
  - **Users likely won’t appreciate vulnerabilities**

Extending MyProxy

- **Why not use MyProxy to securely manage the user's private key and X509 certificate?**
- **Akin to a Kerberos Key Distribution Center (KDC)**

Model #1: MyProxy Key Management

Delivers proxy to user

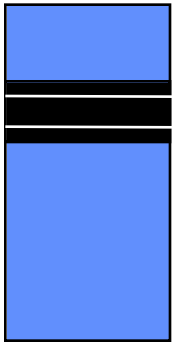


Resource

③ User authenticates with proxy

• User registration
Pass Phrase + UID

② Proxy



MyProxy

Model #2: MyProxy Delegation Cache

2. UID + PP'

Portal

Stores proxy
Delivers proxy to portal

3.2 Proxy'

3.1 UID + PP'

1.1 Registration UID + PP

1.2 MPS Store Proxy PP'

MyProxy

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More Information

National Computational Science Alliance

http://www.ncsa.uiuc.edu

Virtual Machine Room

http://www.ncsa.uiuc.edu/SCD/Alliance/VMR

Globus Project

http://www.globus.org

My Proxy

http://www.dast.nlanr.net/Features/MyProxy/